

# Michigan Energy Code Training and Implementation Program

*1.0 Hour Advanced Program Course Number 16201*

*Residential Energy Air Sealing*



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**MEEA**  
Midwest Energy Efficiency Alliance

**School of Planning, Design  
& Construction**

Michigan State University  
East Lansing, Michigan

# Presenters

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*Course Number: 16201*

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*1 Hour Specialty:*

*BI, MI, or registrants  
with only BO/PR but no  
inspector registration*

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# Acknowledgement and Disclaimer

## Acknowledgement:

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# Project Support

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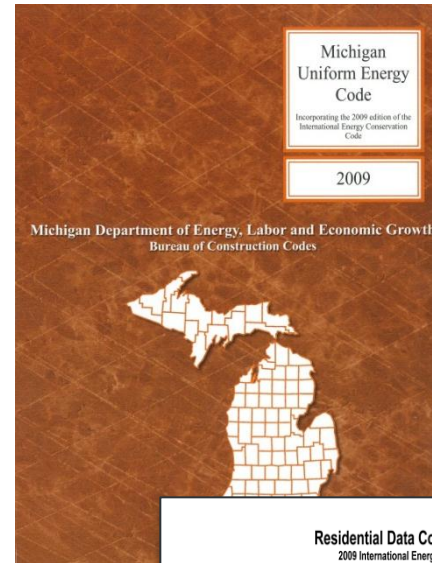
## Project Objectives

To train **building officials, inspectors, home builders, subcontractors, suppliers, engineers and architects** in the air sealing requirements of the Michigan energy code for the purpose of:

1. Increasing understanding
2. Improving compliance
3. Reducing administrative time
4. Improving customer relationships

# Presentation Overview

- Air Sealing Locations
- Testing Option (Blower Door)
- Visual Inspection Option



**Residential Data Collection Checklist**  
2009 International Energy Conservation Code  
Climate Zone 3

Date: \_\_\_\_\_ Name of Evaluator(s): \_\_\_\_\_

Building Name & Address: \_\_\_\_\_ Conditioned Floor Area: \_\_\_\_\_ ft<sup>2</sup>

Building Contact: Name: \_\_\_\_\_ Phone: \_\_\_\_\_ Email: \_\_\_\_\_

Compliance Approach:  Prescriptive (402.1.2 or 402.1.3)  UA Trade-Off (402.1.4)  Building Performance (405)

State: \_\_\_\_\_ Jurisdiction: \_\_\_\_\_

Building Type: 1- and 2-Family, Detached:  Single Family  
Multifamily:  Apartment

Project Type:  New Construction  Addition to existing building

Item Number <sup>1</sup>	Pre-Inspection/Plan Review	Code Value	Verified Value
PR1 [103.2]	Construction drawings and documentation submitted and available. Documentation sufficiently demonstrates energy code compliance.		
PR2 [403.6]	HVAC loads calculations: Heating system size(s): Cooling system size(s):	kBtu/yr kBtu/yr	

Additional Comments: \_\_\_\_\_

**Pre-Inspection/Plan Review**

PR1 [103.2] Documentation. Determine if a complete set of plans/construction drawings, specifications, and energy code compliance documentation is available in the building department. If there is no building department or the locality does not conduct plan review, this information should be obtained from the registered design professional or builder having responsibility for the project. If documentation indicating a trade-off or performance approach is not provided, a prescriptive approach must be assumed for verifying compliance. Construction documents should sufficiently demonstrate energy code compliance, including but not limited to the following information:

- The location and R-values of insulation materials
- U-factors and SHGC values for windows, doors, skylights, and other fenestration products
- Information related to duct and piping location, insulation type and R-value, and means of sealing

Under the assumption that only state or local government with a responsible enforcement and/or permitting agency are included in compliance evaluations, plans and documentation are expected to be held by the responsible agency. If this is not the case, mark this code requirement and its test (PR1 and PR2) as non-compliant, unless there is another entity responsible for enforcement identified (e.g., utility, contractor licensing board, etc.) in which case they should be contacted to review PR1 and PR2 information.

PR2 [403.6] HVAC Load Calculations. Verify that HVAC load calculations have been completed and submitted. Verify the methodology used in the load calculations. List the resultant heating and/or cooling loads as applicable in the Verified Value column.

Building Energy Codes Program

Date visited: 3/14/2011

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RECENT UPDATES

2010 Building Energy Codes Annual Report Released  
posted 03.04.2011

Store + Score Application Released  
posted 03.04.2011

DOE proposed changes to IgCC PV 2.0  
revised 03.10.2011

CODES IN THE NEWS

Notice of Public Meeting: Presenting and Receiving Comments to DOE Proposed Changes to the IgCC  
posted 03.10.2011

A Chance Encounter with the Massachusetts Stretch Energy Code  
Source: New Buildings Institute, 03.02.2011

Energy Efficiency key to Zero Energy Commercial Buildings  
Source: Energy Saving Association, 02.21.2011

# 2009 MUEC Air Sealing Requirements

## *Training Module*



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# Air Leakage (Section 402.4)

Air leakage requirements of the 2009 MUEC are **MANDATORY** provisions.

This means they are required for all compliance approaches:

- Prescriptive
- Trade-off
- Performance

# Demonstrate Compliance

Prescriptive

Trade-off

Performance

“Prescriptive Packages Approach”

“Trade-off Approach” (UA)

“Performance Approach”

**Residential Data Collection Checklist**  
2009 International Energy Conservation Code  
Climate Zone 3

Date: \_\_\_\_\_ Name of Evaluator(s): \_\_\_\_\_  
Building Name & Address: \_\_\_\_\_ Conditioned Floor Area: \_\_\_\_\_ sq ft  
Building Contact Name: \_\_\_\_\_ Phone: \_\_\_\_\_ Email: \_\_\_\_\_  
Compliance Approach:  Prescriptive (ICC 1.2 or ICC 1.3)  UA Trade-Off (ICC 1.4)  Building Performance (ICC 1.5)  
Site: \_\_\_\_\_ Jurisdiction: \_\_\_\_\_  
Building Type: 1- and 2-Family, Attached  Single-Family, Detached  Multi-Family, Attached  Multi-Family, Detached  Other: \_\_\_\_\_  
Project Type:  New Construction  Existing  Other: \_\_\_\_\_

Item Number	Description	Code Value	Verified Value			Complies
			Y	N	N/A	
F01 402.2.8, 303.2f	Foundation Inspection Slab edge insulation R-value installed per manufacturer's instructions.	Unheated: R-5 Heated: R-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F02 402.2.8f	Slab edge insulation depth/length	Heated: 2 R	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F03 402.1.1, 303.2f	Basement wall exterior insulation R-value installed per manufacturer's instructions.	R-5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F04 402.2.7f	Basement wall exterior insulation depth	10 R, or to basement floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F05 402.2.9, 303.2f	Crawl space wall insulation R-value installed per manufacturer's instructions.	R-5 (gross) R-1.0 (cavity)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F06 403.8f	Show melt controls		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F07 403.2.1f	Insulation protection		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Additional Comments: \_\_\_\_\_



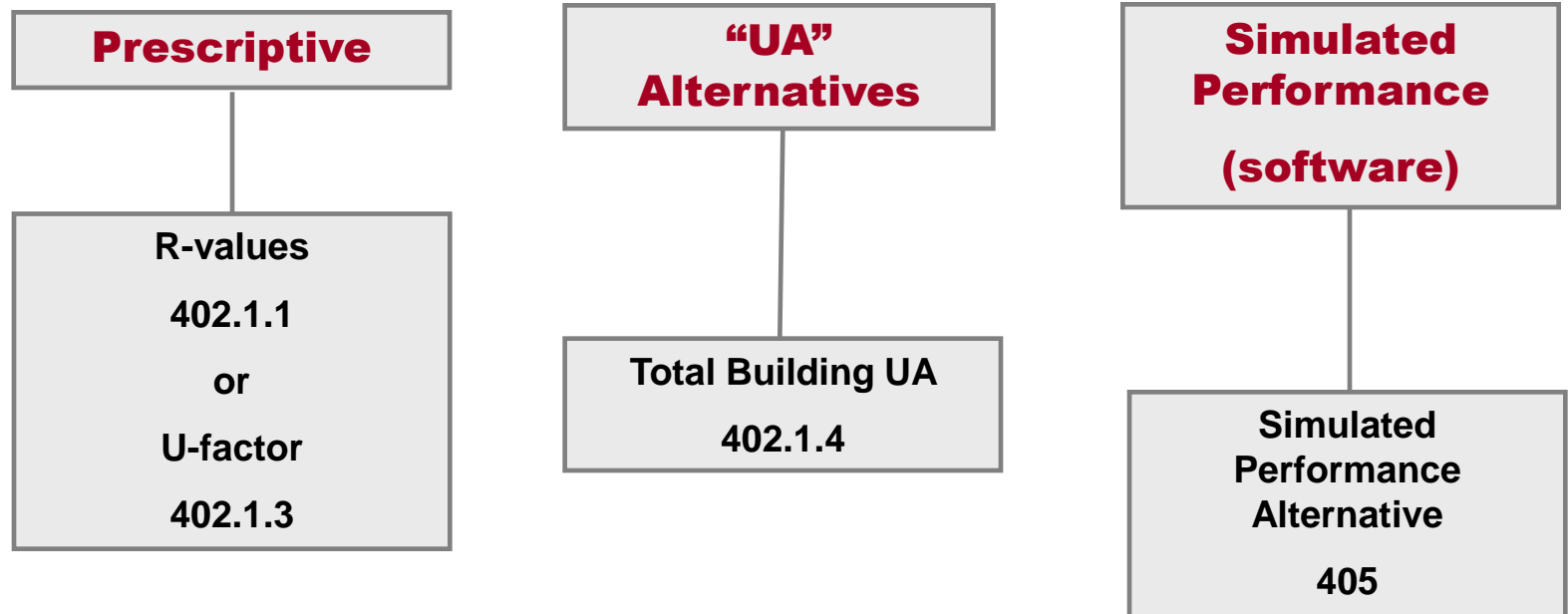
**REScheck**™



Residential Requirements of the 2009 IECC. U. S. DOE Building Energy Codes Program.

<http://www.energycodes.gov/becu/trainers.stm> Date visited: 6/28/2011

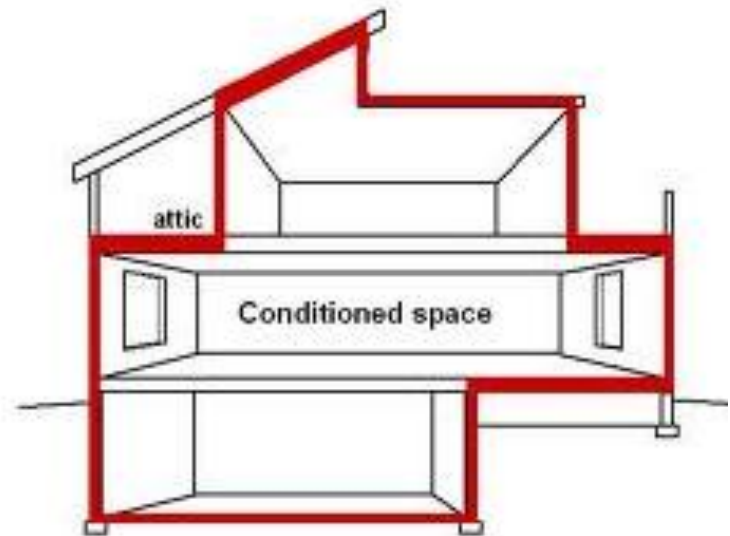
# Demonstrate Compliance: 3 Options



All must meet the air leakage requirements of Section 402.4!

# Identify Conditioned Spaces

An area or room within a building being heated or cooled, containing un-insulated ducts, or with a fixed opening directly into an adjacent conditioned space.



# Building Thermal Envelope (*Section 402.4.1*)

Building thermal envelope shall be:

- Durably sealed to limit infiltration
- Allow for expansion and contraction between dissimilar materials
- 12 specific locations shall be sealed with an air barrier material, suitable film, or solid material

# Building Thermal Envelope (Section 402.4.1)

## Air sealing locations:

- Joints, seams, and penetrations
- Between windows and doors and their jambs and framing



# Building Thermal Envelope (Section 402.4.1)

## Air sealing locations:

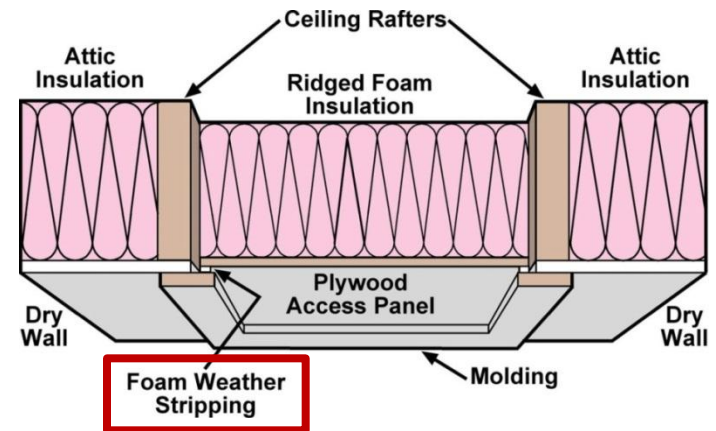
- Utility penetrations
- Walls and ceilings between a garage and conditioned spaces



# Building Thermal Envelope (Section 402.4.1)

## Air sealing locations:

- Chases or dropped ceilings adjacent to the thermal envelope
- Attic access openings





# Building Thermal Envelope (*Section 402.4.1*)

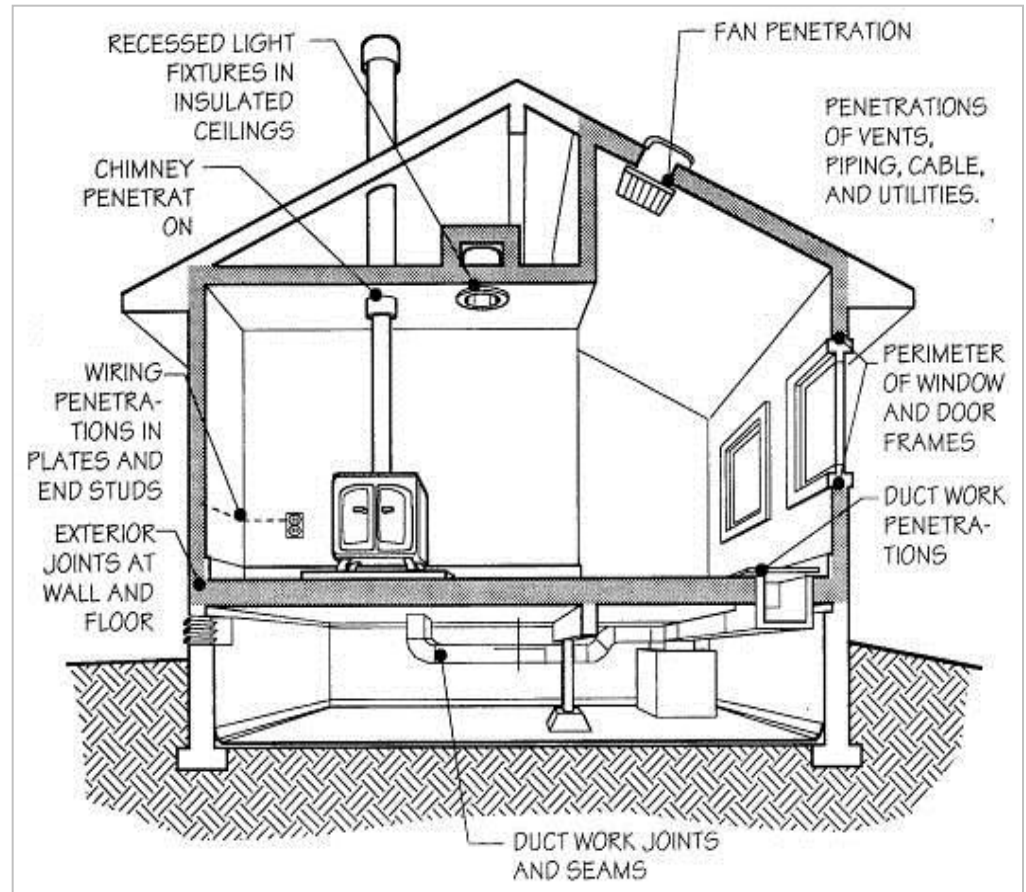
## More common air sealing locations:

- Site-built windows, doors, and skylights
- Knee walls
- Behind tubs and showers on exterior walls
- Common walls between dwelling units for multi-family
- Rim joist junctions
- Other sources of infiltration

# Building Thermal Envelope (Section 402.4.1)

## Typical air infiltration locations:

- Windows and doors
- Between sole plates
- Floors and exterior wall panels
- Plumbing
- Electrical
- Service access doors or hatches
- Recessed light fixtures
- Rim joist junction



# Air Sealing and Insulation (*Section 402.4.2*)

Must be demonstrated by one of the following:

- Testing option (blower door) (*Section 402.4.2.1*)
- Visual inspection option (*Section 402.4.2.2*)

# Testing Option (Section 402.4.2.1)

## Blower door:

- Air leakage maximum 7 ACH
- Tested at 50 Pa (1psf)
- Tested AFTER rough in and all penetrations installed

**Presenter's Note:** Earlier versions of IECC 2009 listed 33.5 psf—corrected to 1 psf in later versions



# Testing Option (Section 402.4.2.1)

## During the blower door testing:

- Windows, doors, fireplace doors, and stove doors closed but not sealed
- Dampers closed but not sealed
- Interior doors open
- Openings for continuous ventilation systems and heat recovery ventilators closed and sealed
- Heating and cooling systems turned off
- HVAC ducts not sealed
- HVAC supply and return registers not sealed



Residential Requirements of the 2009 IECC. U. S. DOE Building Energy Codes Program.

<http://www.energycodes.gov/becu/trainers.stm> Date visited: 6/28/2011

# Visual Inspection Option (*Section 402.4.2.2*)

- Requires field verification of applicable components of Table 402.4.2
- Building Official may require independent third party inspection

# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Air and thermal barriers:

- For framed walls, exterior insulation in substantial contact and continuous alignment with envelope air barrier
- Fill or repair breaks or joints in air barrier
- Air-permeable insulation not used as sealant
- Air-permeable insulation inside of an air barrier



# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Ceiling/attic:

- For dropped ceilings or soffits, air barrier aligned with insulation and gaps sealed
- Seal attic access, pull down stair, or knee wall door (except for unvented attics)



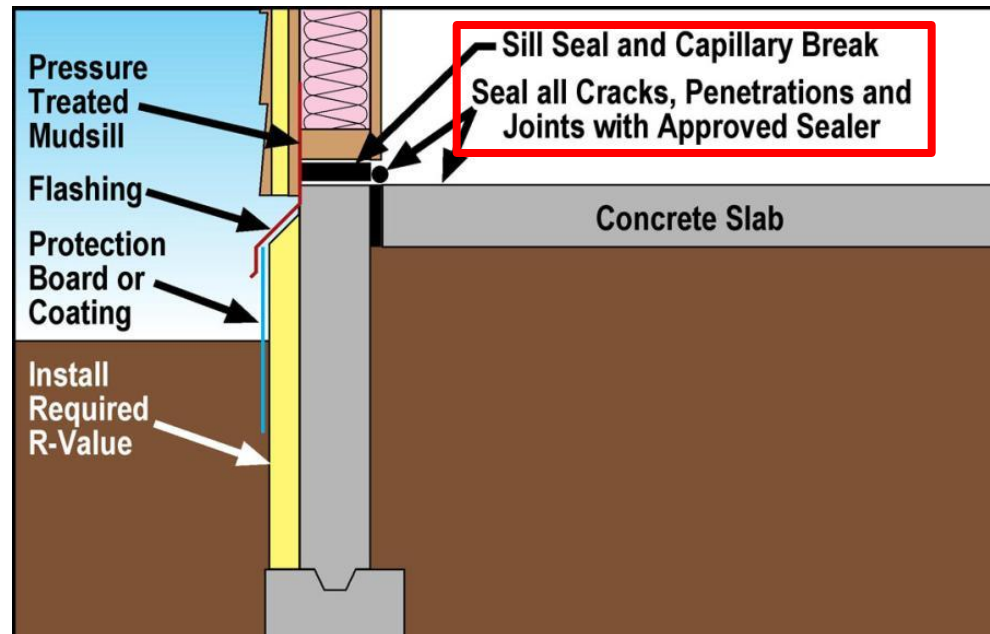


# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Walls:

- Insulation installed at corners and headers
- Sill plate sealed at foundation



# Visual Inspection Option (*Section 402.4.2.2*)

## Visual inspection locations

Doors and windows:

- Sealed between all door and window jambs and framing



ANSI/ASHRAE/IES Standard 90.1-2010. U. S. DOE Building Energy Codes Program.

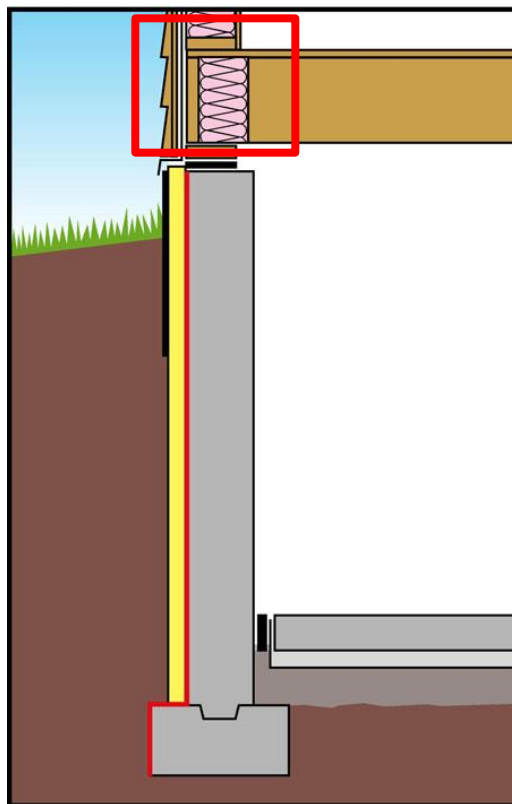
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# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

Rim joists:

- Insulated and includes an air barrier

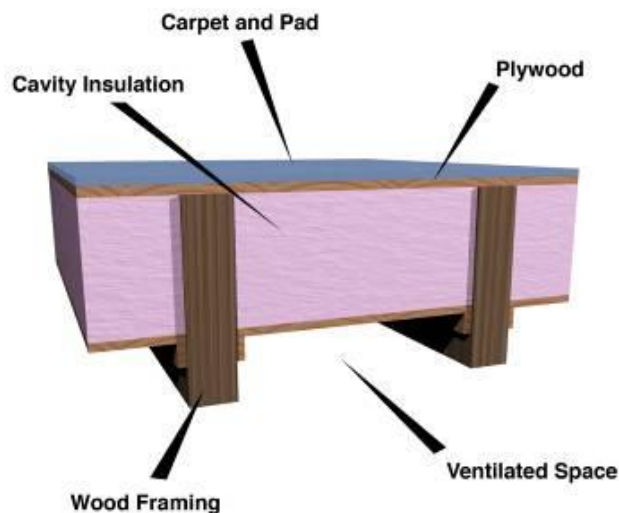


# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Floors:

- Insulation is installed in permanent contact with underside of decking
- Any exposed edges of insulation covered by an air barrier



# Visual Inspection Option (*Section 402.4.2.2*)

## Visual inspection locations

### Crawl space walls:

- Insulation permanently attached
- Class I vapor retarder with taped overlapping joints covering exposed earth in unvented crawl spaces



# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Shafts and penetrations:

- Sealed duct shafts, utility penetrations, knee walls, and flue shafts opening to unconditioned spaces



# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Recessed lighting:

- Air tight, IC rated, and sealed to drywall
- Exception: fixtures installed in conditioned spaces



# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### Plumbing and wiring:

- Insulation placed between exterior sheathing and pipes
- Batt insulation cut to fit around wiring and pipes or spray/blown insulation placed between exterior sheathing and pipes or wires





# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

Electrical boxes on exterior walls:

- Air sealed boxes installed or air barrier to extend behind boxes



# Visual Inspection Option (Section 402.4.2.2)

## Visual inspection locations

### HVAC register boots:

- Boots penetrating envelope sealed to drywall or subfloor



ANSI/ASHRAE/IES Standard 90.1-2010. U. S. DOE Building Energy Codes Program.

<http://www.energycodes.gov/becu/trainers.stm> Date visited: 6/28/2011

# Visual Inspection Option (*Section 402.4.2.2*)

## Visual inspection locations

### Narrow cavities:

- Batts cut to fit or cavity filled with sprayed/blown insulation

### Garage separation:

- Air sealed between garage and conditioned spaces

### Shower/tub on exterior wall:

- Insulation and air barrier separating shower/tub and exterior wall

### Common wall:

- Air barrier between dwelling units

### Fireplace:

- Air barrier included for fireplace walls

# Fireplaces (Section 402.4.3)

New wood-burning fireplaces shall have gasketed doors and outdoor combustion air



# Fenestration Air Leakage (Section 402.4.4)

- Maximum infiltration rate of 0.3 cfm/sf
- Maximum rate of 0.5 cfm/sf for swinging doors
- NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440
- Must be listed and labeled
- Site-built windows, skylights and doors are *exempt* from the leakage test

 National Fenestration Rating Council® <b>CERTIFIED</b>	<b>World's Best Window Co.</b>  Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: <b>Vertical Slider</b>
<b>ENERGY PERFORMANCE RATINGS</b>	
U-Factor (U.S./I-P) <b>0.30</b>	Solar Heat Gain Coefficient <b>0.30</b>
<b>ADDITIONAL PERFORMANCE RATINGS</b>	
Visible Transmittance <b>0.51</b>	Air Leakage (U.S./I-P) <b>0.2</b>
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedure for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>	

# Recessed Lighting (Section 402.4.5)

Recessed lighting fixtures in the thermal envelope must meet one of the following:

- Type IC rated and labeled in a sealed or gasketed enclosure
- Type IC rated and labeled as meeting ASTM E 283
- Michigan provides for installation of a non-IC rated fixture in a fire-rated box with insulation over

**All recessed lighting must be sealed with a gasket or caulk between the housing and interior wall or ceiling covering**





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